

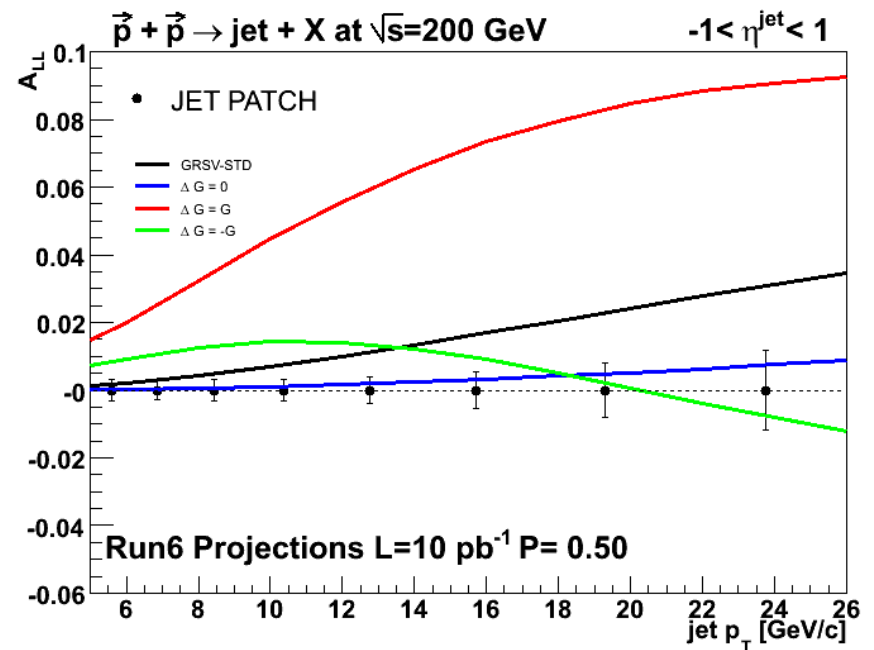
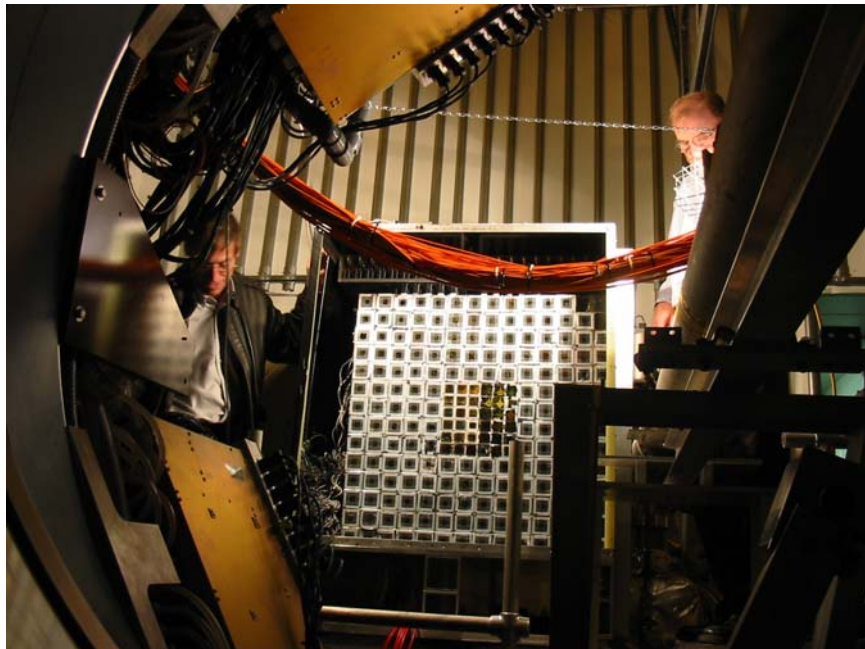
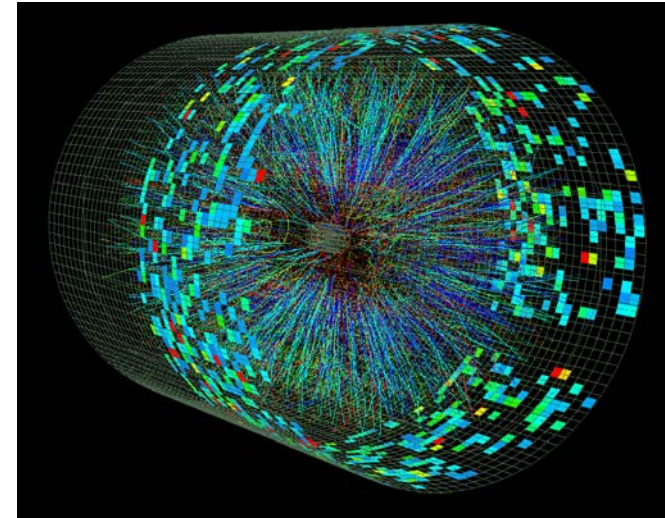
W.B. Christie, BNL

*RHIC Retreat 2006*

*July 10, 2006.*

## Outline

- How we did on reaching our Goals for the run
- Plans(?) for FY07 Run
- Comments on Run 6



## STAR Run Plan for 20 week RHIC Run

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Star RUN request is for polarized pp beams, at  $\sqrt{s} = 200$  GeV, for all Physics running. A “mid-point projection” for integrated luminosity for  $\sim 11.5$  wks gives  $\sim 45 \text{ pb}^{-1}$  delivered  $\rightarrow$  gives  $15 \text{ pb}^{-1}$  sampled at STAR

Note: exact breakdown of time, and order, of transverse ( $\sim 5 \text{ pb}^{-1}$  *sampled*) and longitudinally ( $\sim 10 \text{ pb}^{-1}$  *sampled*) polarized beams to be finalized. For now, STAR would like to reserve the possibility to change choice of spin orientation up to 2 times during the  $\sqrt{s} = 200$  GeV running period.

STAR also supports a limited period of “500 GeV” Collider commissioning. Limited meaning sufficient to confirm work done since last “500 GeV” commissioning (e.g., ring re-alignment), and make next step forward. Hopefully this means something on the order of 2 to 3 days.

## Transverse running

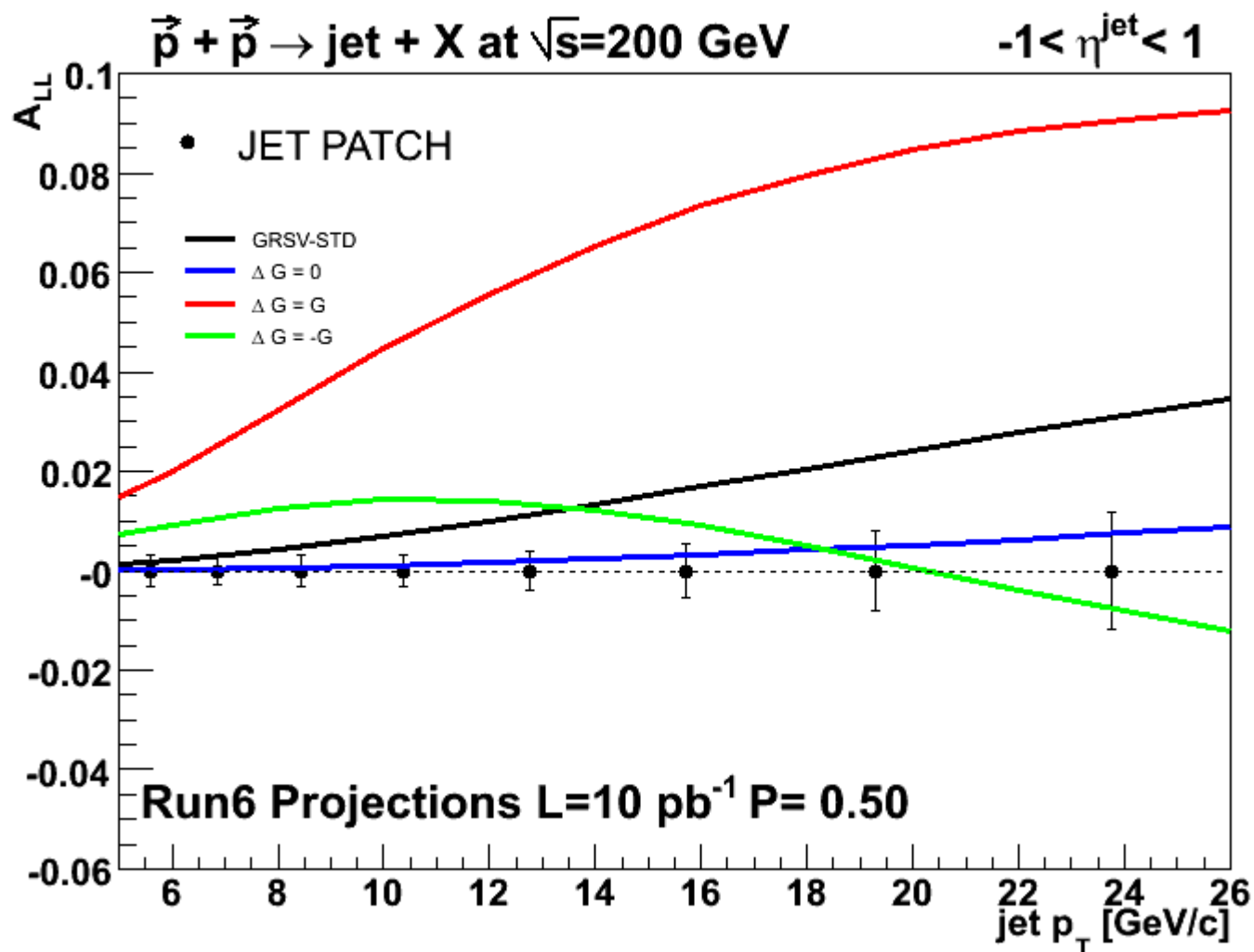
- Significant result for forward rapidity Sivers via FPD++
- Significant result for Sivers function for mid-rapidity di-jets

## Longitudinal running

- Significant result for  $A_{LL}$  via inclusive jets
- $\pi_0$   $A_{LL}$  in B/EEMC
- Initial sample of di-jets and direct gamma (for ultimate goal of  $\Delta G(x)$ )

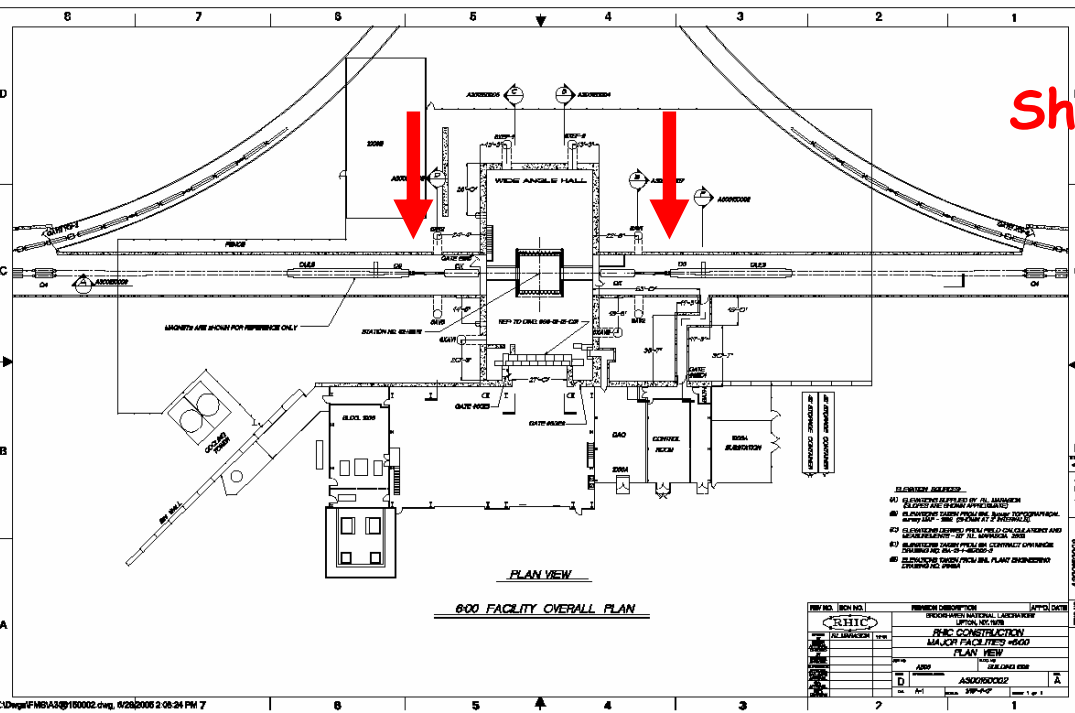
The exact details of what will come out from the FY06 Data set awaits the reconstruction and analysis of the data. STAR is confident that all of the stated physics goals for this run will be met.

# Inclusive Jet Production - STAR Run 6 Projections



Measurement  
should be  
sensitive at  
standard  
GRSV model  
prediction  
level with jet  
patch trigger!





Shielding added in Tunnels at STAR

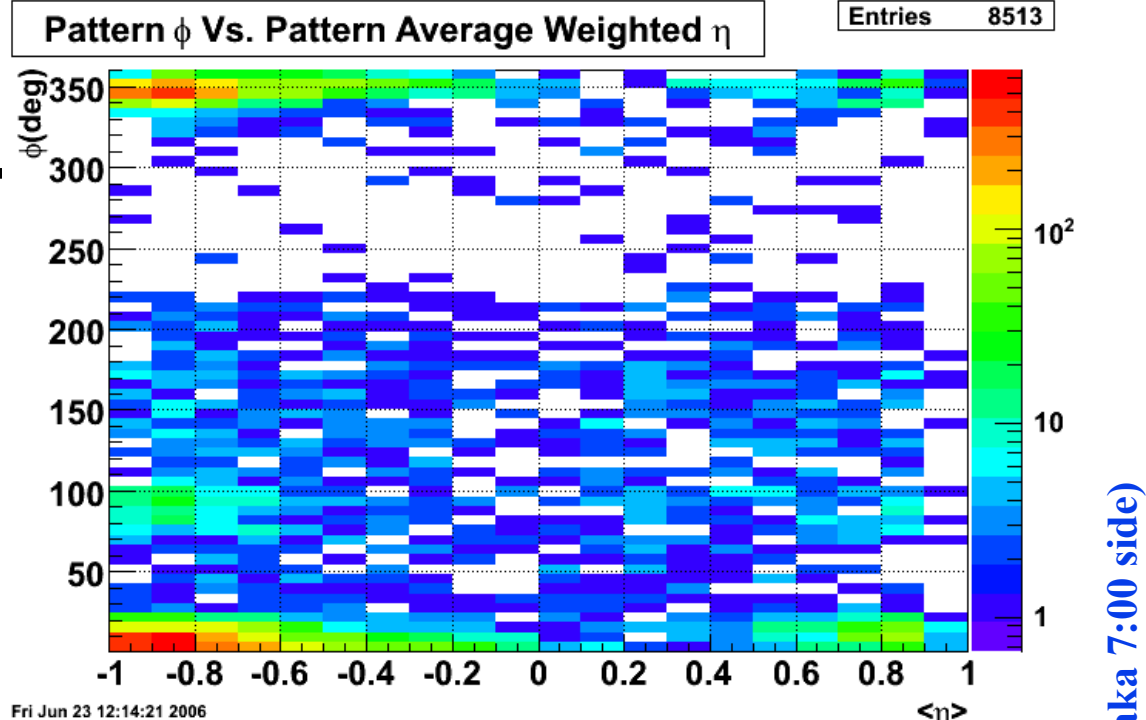




Before additional East -  
South Shielding



South  
Bottom  
North  
Top

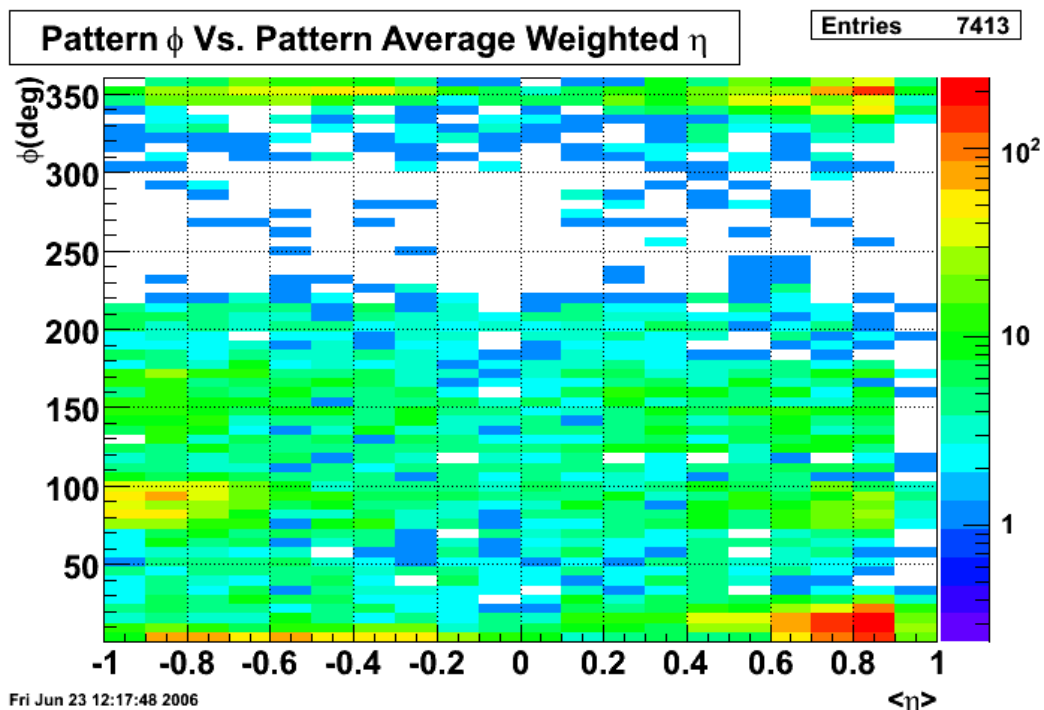


“Background” defined as  
4 or more towers adjacent in  $\eta$

After additional East -  
South Shielding



Additional Shielding led to  
dramatic improvement. Request at  
this time is to close holes at East-  
North, and West - North and  
South.



# Estimating Delivered Luminosity for FY06 pp Physics Run

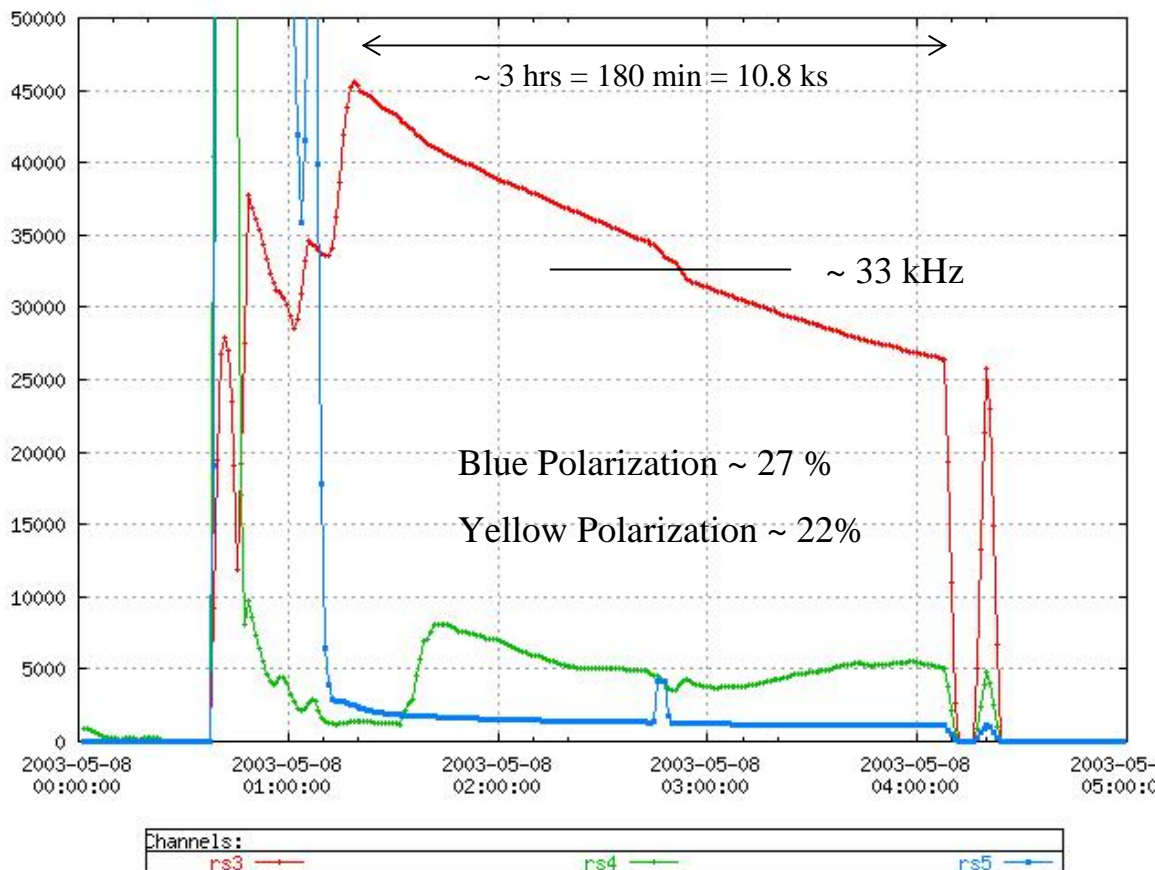


Compiled by: Bill Christie, BNL

Store on Thursday morning, May 8th (N.B. This example calc. uses 2003 store).

$\sigma_{\text{BBC Coin.}} \sim 25 \text{ mb}, \Rightarrow 25 \text{ kHz BBC coin rate} \sim 1 \times 10^{30} \text{ cm}^{-2} \text{ s}^{-1}$

$1 \text{ nb}^{-1} = 10^{33} \Rightarrow 1000 \text{ s @ } 25 \text{ kHz BBC rate} \sim 1 \text{ nb}^{-1}$



Therefore, a rough estimate for this store is that we received about:

$(33 \text{ kHz}/25 \text{ kHz})(10.8 \text{ ks}/1 \text{ ks}) = 14.2 \text{ nb}^{-1}$  of delivered Luminosity.

N.B. The mb collision rate is  $\sim 1.12 * \text{RICH BBC coin. Rate}$ . So effective

$\sigma_{\text{mb.}} \sim 28 \text{ mb}$

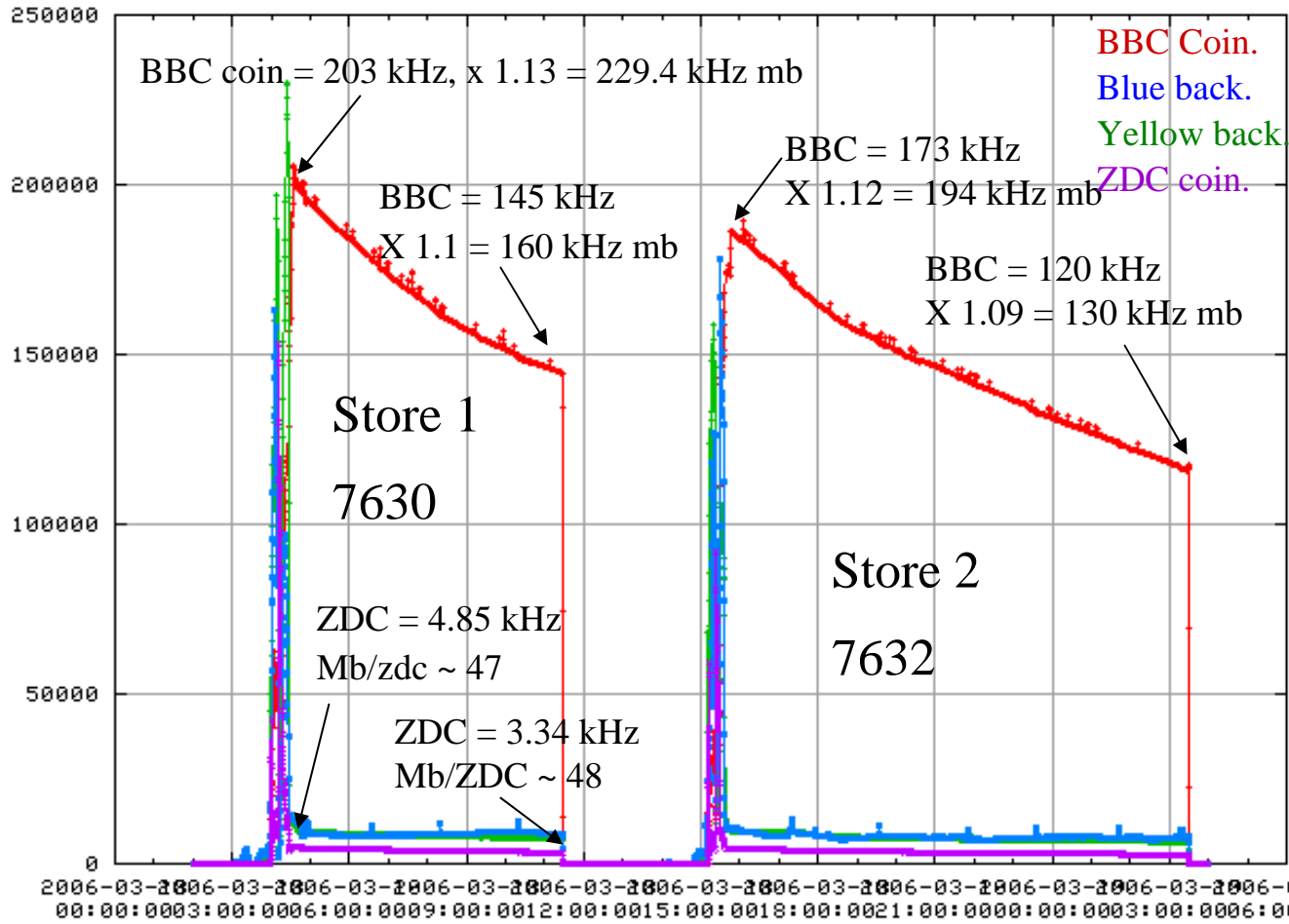
N.B.  $\sigma_{\text{BBC coin.}} / \sigma_{\text{mb}}$  rate depen.



# Estimated Integrated Luminosity Delivered on Saturday, March 18th

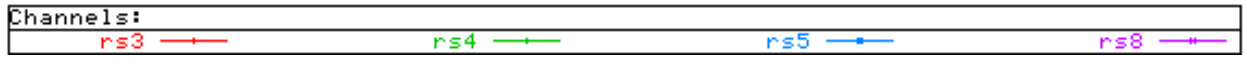
Store 1 ~ 7.0 hrs @ 194 kHz ~ 181 nb<sup>-1</sup> (RHIC = 200 nb<sup>-1</sup>)  
Store 2 ~ 11.8 hrs @ 162 kHz ~ 255 nb<sup>-1</sup> (RHIC = 290 nb<sup>-1</sup>)

N.B. STAR Calculations use 27 mb for mb cross section



RHIC Values:  
7630: 0.20 pb-1  
7.2 hrs  
7632: 0.29 pb-1  
11.48 hrs

RHIC vs STAR Int. L:  
200 - 181/181 = .10  
290 - 255/255 = .14





# Estimated Integrated Luminosity Delivered on Thursday, April 6th

Store 1 ~ 2.25 hrs @ 373 kHz ~ 112 nb<sup>-1</sup>

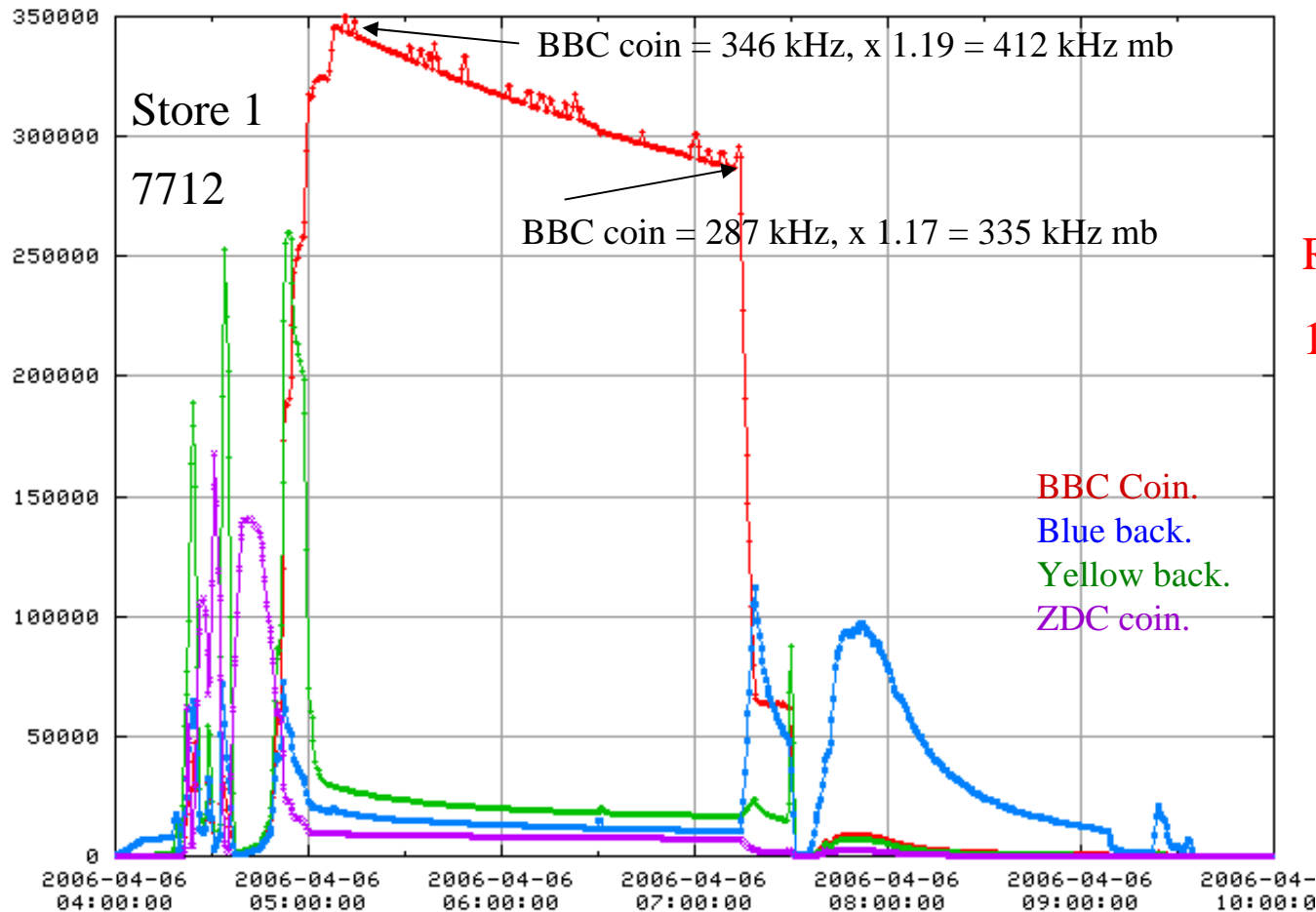


RHIC Values:

3.4 hrs

150 nb<sup>-1</sup>

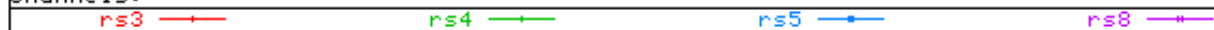
N.B. STAR Calculations use 27 mb for min-bias cross section



RHIC vs STAR Int. L:

$$150 - 112/112 = .33$$

Channels:



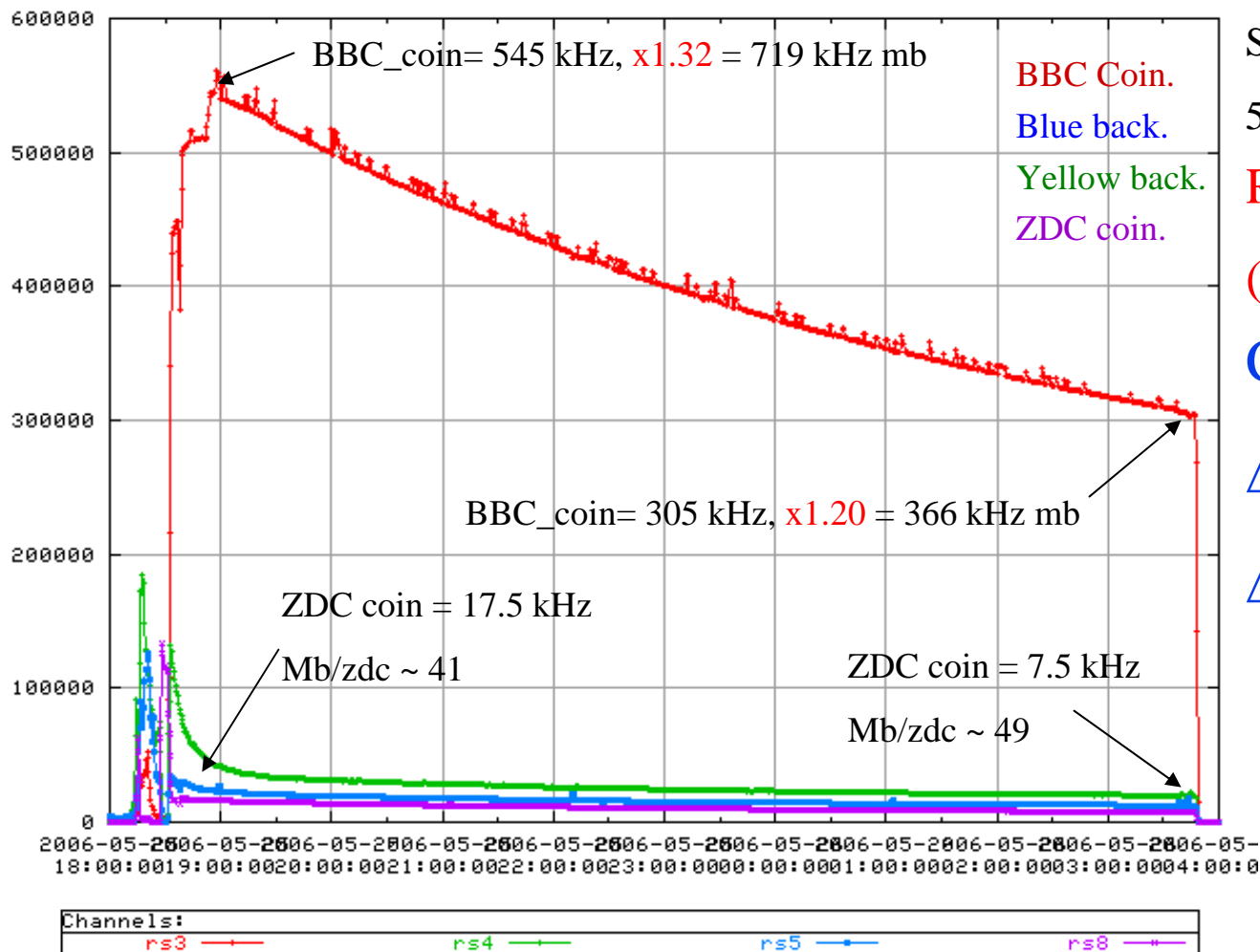
# Estimated Integrated Luminosity Delivered on Thursday, May 25th

## GOLDEN STORE



Store ~ 9.0 hrs @ 542.5 kHz ~ 651 nb<sup>-1</sup>

$$\text{Ave. mb rate} = (719 - 366)/2 + 366 = 542.5 \text{ kHz}$$



Store averaged Luminosity

$$542.5/27 \sim 2.0 \times 10^{31} \text{ cm}^{-2} \text{ s}^{-1}$$

RHIC vs STAR Int. L:

$$(690 - 651)/651 = 0.06$$

Change in Ratios

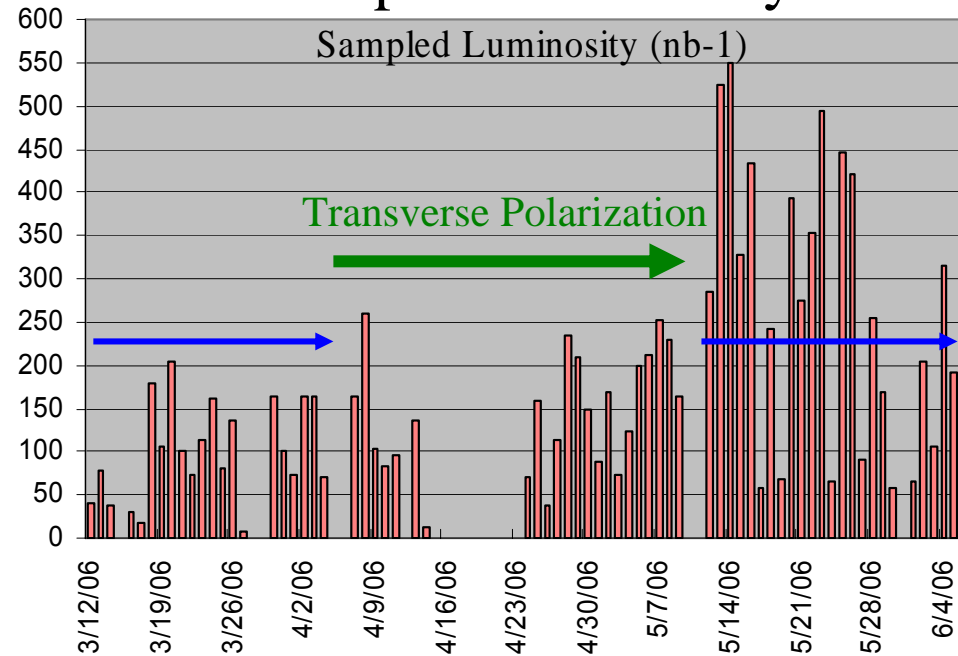
$$\Delta(\text{mb/ZDC}) \sim 20\%$$

$$\Delta(\text{mb/BBC}) \sim 10\%$$

Tentative Conclusion:

Reported integrated luminosities probably too high by ~ 8 to 10%

# Final Sampled Luminosity\* for FY06 pp run Data Set



STAR Calc. Of sampled L used  $\sigma_{mb}$  of 25 mb. Correct value probably  $\sim 27$  mb. This means sampled luminosities below probably too high by  $\sim 8\%$ .

Longitudinal Polarization

N.B.  $10 \text{ pb}^{-1}$  @ 50% P  $\Rightarrow$  FOM =  $625 \text{ nb}^{-1}$

6.39 @ 60%  $\Rightarrow$  FOM  $\sim 828 \text{ nb}^{-1}$

Sampled Luminosity:

Longitudinal Polarization: (prior to trans.)

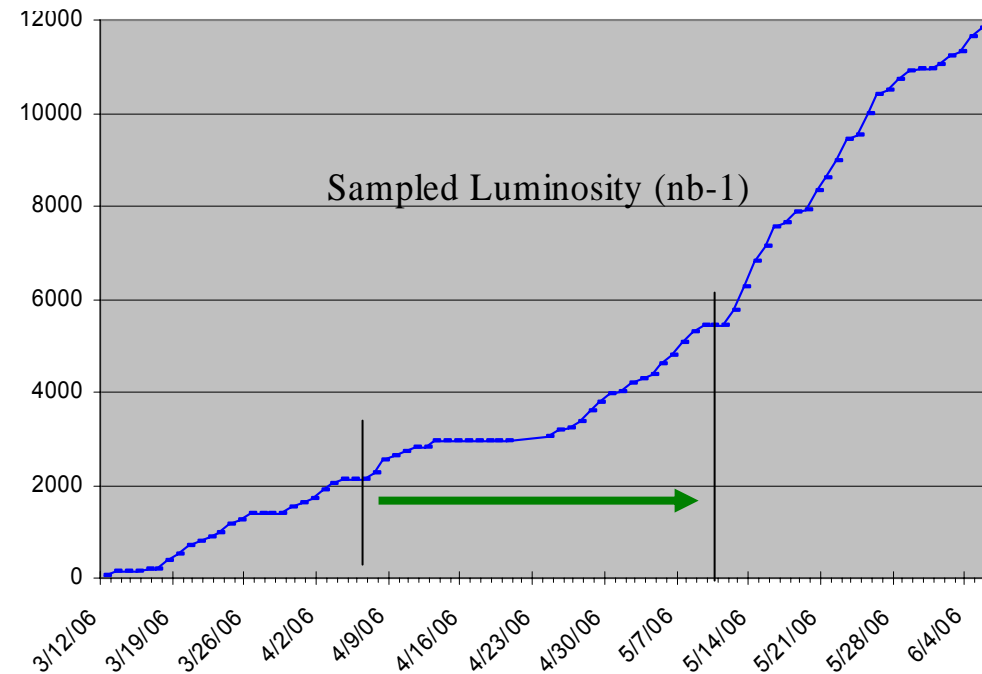
2.1  $\text{pb}^{-1}$  Goal 10  $\text{pb}^{-1}$

Transverse Polarization:

3.34  $\text{pb}^{-1}$  Goal  $\sim 3 \text{ pb}^{-1}$  (Di-Jets)

Longitudinal Polarization: (after trans.)

6.39  $\text{pb}^{-1}$  (FOM  $\sim 828 \text{ nb}^{-1}$ )



\*As tabulated by Bill Christie

# Rough Estimate of STAR Operations Efficiency



Exp	pp vs energy	Pol	Goal			Actual				FOM Goal		FOM Actual		% of Goal			
			% Pol	Recorded L	Delivered L	Recorded L	Delivered L	Average Pol	Recorded L	Delivered L	Recorded L	Delivered L	Recorded	Delivered			
				pb <sup>-1</sup>	pb <sup>-1</sup>	pb <sup>-1</sup>	pb <sup>-1</sup>			pb <sup>-1</sup>	pb <sup>-1</sup>	pb <sup>-1</sup>		pb <sup>-1</sup>			
PHENIX	200 GeV	R	50%	4-7	10-17	3.1	14.4		52.9%		1-1.8	2.5-4.3	0.87	*	4.03	87%	161%
	200 GeV	L	60%	10	30	7.5	31.1		60.5%		1.3	3.9	1.00	*	4.19	78%	108%
	62.4 GeV	T+L	N/A	0.15	0.60	0.1	0.39		N/A		N/A	N/A	N/A		N/A	67%	66%
	62.4 GeV	T	50%			.025	0.16	**	49.8%		N/A	N/A	0.0062	*	0.039		
	62.4 GeV	L	55%	0.10	0.4	.075	0.24		47.5%	***	0.009	0.037	0.0038	*	0.012	42%	33%
STAR	200 GeV	T	50%	3.00	15	3.34	18.9		57.6%		0.8	3.8	1.11	*	6.25	148%	167%
	200 GeV	L part 1##				2.1	7.87		51.8%				0.15	*	0.57		
		L part 2				6.39	19.4		61.2%				0.90	*	2.72		
		L total	50%	10	30	8.49	27.3		59.0%		0.6	1.9	1.03	*	3.30	165%	176%
	62.4 GeV	T	N/A	N/A	0.5	.084	0.34	**	48.3%	***	N/A	N/A	0.020	*	0.079	N/A	68%
BRAHMS	62.4 GeV	T	50%	0.85	1.4	0.21	0.36	#	48.2%	***	0.21	0.35	0.049	*	0.083	23%	24%
* ppile estimate from PHENIX and STAR input																	
** missing first physics store 7998 (estimated)																	
*** to be revised once jet target data is analyzed																	
# assumes BRAHMS Lumi 1.05 x STAR for stores through 12 June																	
## taken during STAR tune-up phase																	

## 200 GeV Longitudinal Running:

Reported values - 27.3 pb<sup>-1</sup> delivered, 8.49 pb<sup>-1</sup> sampled

STAR ran this program with ~ 50% deadtime ⇒ Possible to sample 27.3/2 ~ 13.6 pb<sup>-1</sup>  
8.49/13.6 ~ 62% “Efficiency”.

## 200 GeV Transverse Running:

Reported values - 18.9 pb<sup>-1</sup> delivered, 3.34 pb<sup>-1</sup> sampled.

STAR ran this program with ~ 75% deadtime ⇒ Possible to sample 18.9/4 ~ 4.7 pb<sup>-1</sup>  
3.34/4.7 ~ 71% “Efficiency”

*N.B. There is Calibration data that we must take which, in this calc., shows up as an inefficiency (~ 10 to 12%)*

# STAR tentative plans for FY07 Run



The STAR FY07 BUR is a topic of discussion at the STAR Collaboration mtg taking place this week in Boston (MIT). The deadline to turn in the final BUR is August 18th. There are Resource and schedule issues which we hope will be clarified soon which influence the STAR BUR choices.

The most likely BUR for STAR will include (still some money and schedule issues to resolve):

- ~ 11 weeks of top Energy Au
- ~ 2 weeks of low Energy (TBD,  $\sim \sqrt{s} = 19 \text{ GeV?}$ ), one wk comm., one week Physics
- ~ 10 weeks of d-Au

A likely fallback BUR for STAR would include:

- ~ 11 weeks of top Energy Au
- ~ 2 weeks of low Energy (TBD,  $\sim \sqrt{s} = 19 \text{ GeV?}$ ), one wk comm., one week Physics
- ~ 10 weeks of 200 GeV polarized pp.



# General Observations and Comments on Run 6



- To a very large degree, my major criticism at the RHIC 05 Retreat was addressed. The Scheduling Physicist took ownership of the Schedule for the 06 run. This forces a degree of rigor on all parties (Collider Coord., Experiments, APEX, Accesses, etc.) which facilitates coordination, and increases efficiencies.

## Other Scheduling Comments:

1.) In discussions prior to the start of the Physics run STAR was pressured to agree to coordinating our desired polarization direction changes (we stated that we wanted two for 200 GeV running) with PHENIX. The PHENIX plan, which we were asked to consider adopting, was that the collider would be reconfigured after 4 weeks, independent of any specified luminosity goal. After very careful and deliberate debate within STAR, we formally agreed to adopt this plan. When the agreed upon date came to reconfigure the collider, STAR stuck with the PHENIX plan. PHENIX, with neither explanation nor justification, did not!

At this juncture, the ALD should have required PHENIX to explain/justify this deviation from the plan. The only comment regarding the Scheduling Physicist role here is that perhaps he should have called this question to the ALDs attention.

2.) There were a number of accesses, many of them for significant increments of time (i.e. greater than an hour), that were associated with PHENIX installing, removing, and debugging prototype detectors. This led to unplanned for interruptions in the STAR Physics running. These access needs were not discussed prior to the run, and as they kept appearing throughout the run, their number, lengths, and justifications were never clearly or completely presented.

After about two of these unplanned for interruptions PHENIX should have been required to present their entire prototype testing plan and needs for discussion and approval.

# General Observations and Comments on Run 6 (2)

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## Other Scheduling Comments (cont.):

### 3.) The 62 GeV run:

- Late decision by PHENIX to go for Longitudinal Polarization.
- It was clearly not well thought out what this would take (time to calibrate local polarimeter).
- This led to interruption in Collider comm. for multiple stores prior to first weekend. Solitary decision by PHENIX Friday afternoon to push off decision until Monday (and subsequent running over weekend without optimally tuned collider), then loss of another day to comm. collider with rotators on the following week.

The end result was a significant degradation in the 62 GeV Physics run.

- Once the first PHENIX estimate for transverse needs (a few hours) proved incorrect, decisions on changes to the plan should have been jointly discussed and decided.

4.) The scheduling for the final few sessions of APEX was not done well. The complications for the schedule in June were known well in advance. Fulvia was tasked, with a few weeks notice, to present a plan for critical/important APEX Exp. to the RHIC Coord. Mtg. While she discussed general APEX concerns, no plan was presented, and hence there was no schedule/period for the following weeks APEX. On the weekend, independent of the RHIC Coord. Mtg, it was decided to allocate 18 hours to APEX.

Suggested action: When Fulvia failed to present the requested plan at the Coord. Mtg. APEX should have been allocated 12 hours, and the matter closed.

# General Observations and Comments on Run 6 (3) STAR

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## Final Scheduling Comment:

5.) Scheduled Accesses. That Scheduled accesses happen on the agreed upon schedule (date and time) is extremely important to STAR's offsite Sub System Managers and Experts. The effort to hold to these schedules should increased!

I know well the choices/options that presented themselves during the run which led to last minute changes to the Schedule for a few of these accesses, but I can't stress enough how disturbing STAR collaborators (aka BNL Users) find these deviations from the Scheduled Access schedules.

## Other Comments:

- Back to Back Time & RHIC Coord. Mtgs saved time and reduced repetition. This change should be kept for 07.
- For most accesses to the STAR IR there is no need to turn off the STAR magnet. This point, and a clear agreement on when it must be turned off for access, should be addressed in discussions between C-AD and STAR Operations.
- I would like to request that the results of ALL the Vernier Scans (Date, time, calculated luminosity) be documented and passed to the experiments in a timely fashion (ideally within a few days of the measurements).
- Some collaborators would like to have Read-only access to the Collider Logbook from offsite.

Please note: While difficult, the 06 run was extremely productive, and STAR accumulated a very significant, important data set. The performance achieved by the Collider, which is directly due to the hard work of everyone in C-AD, was nothing short of incredible!

The utility of these Retreats is to point out things that one feels could have been done better, hence my comments which all could be viewed as critical. No offense is intended!